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(54) **Battery cell protecting case for use in power batteries**

(57) A battery cell protecting case for assembling a battery cell having a positive pole and a negative pole in a conductive battery housing being electrically connected to one of the positive pole and the negative pole is provided. The battery cell protecting case includes a conductive supporting plate being electrically connected to the other one of the positive pole and the negative pole of the battery cell and a nonconductive bracket coupled to the conductive supporting plate. The conductive sup-

porting plate is provided with a layer of insulative material and an exposed portion without insulative material formed thereon. The nonconductive bracket defines a through slot corresponding to the exposed portion. The exposed portion can electrically connect with the conductive battery housing via the through slot due to deformation of the conductive battery housing under pressure, so as to short circuit the power battery.

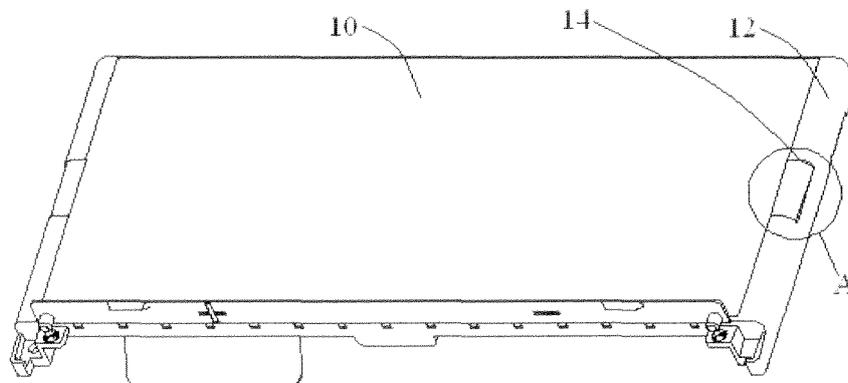


FIG. 1

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Description**CROSS-REFERENCE TO RELATED APPLICATION**

[0001] The present patent application claims the benefit of Chinese Patent Application Number CN 201310090765.4, filed on March 20, 2013, the disclosure of which is hereby incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present patent application generally relates to power batteries, and more particularly, relates to a battery cell protecting case for use in power batteries, especially hard shell power batteries.

BACKGROUND OF THE INVENTION

[0003] With rapid development of society and enhancement of people's awareness of environmental protection, rechargeable batteries are becoming more and more popular as power sources in various kinds of equipments, for instance mobile phones, electric tools, notebook computers, electric vehicles and power stations. The electric vehicles and the power stations usually need a power battery with a large capacity. To improve the safety performance in use of the rechargeable battery, a hard shell power battery is required.

[0004] Safety performance of a power battery, such as a lithium ion battery, used as vehicle battery plays a very important role. At present, the main way to ensure the safety performance of a power battery under pressure is to install a positive electrode metal plate and a negative electrode metal plate in the power battery. The positive electrode metal plate and the negative electrode metal plate are connected to each other to short circuit the power battery when the power battery is excessively pressed.

[0005] However, metal plates will inevitably reduce the mass energy density of the power battery, increase the complexity of the mechanical structure of the power battery, and reduce the reliability of the power battery.

[0006] What is needed, therefore, is to provide a hard shell power battery having desirable safety performance which can short circuit the power battery when the power battery is excessively pressed.

SUMMARY OF THE INVENTION

[0007] One objective of the present invention is to provide a power battery which can short circuit the power battery under overpressure, so as to avoid safety accident in the use of the power battery.

[0008] According to one aspect of the present invention, a battery cell protecting case for assembling a battery cell having a positive pole and a negative pole in a conductive battery housing being electrically connected to one of the positive pole and the negative pole is pro-

vided. The battery cell protecting case includes:

a conductive supporting plate being electrically connected to the other one of the positive pole and the negative pole of the battery cell, and the conductive supporting plate being provided with a layer of insulative material for insulatively separate the conductive supporting plate from the conductive battery housing the and an exposed portion without insulative material formed thereon; and

a nonconductive bracket coupled to the conductive supporting plate, the nonconductive bracket having a through slot corresponding to the exposed portion, the exposed portion being capable of electrically connecting with the conductive battery housing via the through slot due to deformation of the conductive battery housing under pressure.

[0009] According to one aspect of the present invention, an outer surface of the nonconductive bracket is 0.5 to 3.0mm higher than an outer surface of the conductive supporting plate.

[0010] According to one aspect of the present invention, the conductive supporting plate is formed with a layer of nonconductive separator, and the exposed portion in the through slot is formed with at least one sharp protrusion which can pierce the separator and contact the deformed conductive battery housing when pressure on the power battery is greater than a predetermined value.

[0011] According to one aspect of the present invention, the sharp protrusion is 0.1 to 1.0mm lower than the outer surface of the nonconductive bracket.

[0012] According to one aspect of the present invention, the nonconductive bracket is formed with a cross strip having a width of 1 to 5mm over the through slot.

[0013] According to one aspect of the present invention, the nonconductive bracket defines at least two through slots with a blocking portion having a width of 1 to 3mm between two adjacent through slots, a cutout for receiving the blocking portion is defined below the blocking portion, the blocking portion is deformed to be received in the cutout when the pressure on the power battery is greater than a predetermined value, thereby causing the deformed conductive battery housing to electrically connect with the exposed portion in the through slot.

[0014] According to one aspect of the present invention, the nonconductive bracket is formed with a locking block extending into the through slot to press against the exposed portion, the locking block is deformed when the pressure on the power battery is greater than a predetermined value to release the exposed portion, thereby causing the exposed portion to rebound up and to electrically connect with the conductive battery housing.

[0015] According to one aspect of the present invention, the through slot is defined in a center of the nonconductive bracket.

[0016] According to one aspect of the present inven-

tion, the through slot has a curvature of 60 to 90 degrees and a width of 10 to 50mm, preferably 20 to 30mm.

[0017] According to one aspect of the present invention, a hard shell power battery is provided. The hard shell power battery includes:

a conductive battery housing;

a pair of battery cell protecting cases corporately defining a receiving chamber for receiving a battery cell positioned in the battery housing, each battery cell protecting case comprising a conductive supporting plate being provided with a layer of insulative material for insulatively separate the conductive supporting plate from the conductive battery housing and an exposed portion without insulative material formed thereon and

two nonconductive brackets at two sides of the conductive supporting plate, each nonconductive bracket defining a through slot corresponding to the exposed portion of the conductive supporting plate; and

a battery cell having a positive pole and an negative pole accommodated in the receiving chamber, one of the positive pole and the negative pole being electrically connected with the conductive supporting plate and the other one of the positive pole and the negative pole being electrically connected to the conductive battery housing, the exposed portion being capable of electrically contacting the conductive battery housing via the through slot due to deformation of the conductive battery housing under pressure, so as to short circuit the power battery.

[0018] Compared with the prior art, the hard shell power battery of the present invention does not need additional mechanical structure. When deformed under pressure, the conductive battery housing can be electrically connected to the exposed portion via the through slot defined in the nonconductive bracket, to short circuit the power battery and reduce the voltage of the battery cell. Thus, safety performance of the power battery under pressure is improved.

[0019] Other advantages and novel features will be drawn from the following detailed description of preferred embodiments with the attached drawings. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the present invention and, together with a general description of the invention given above, and the detailed description of the embodiments given below, serve to explain the principles of the invention:

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a schematic view of a battery cell protecting case for use in a hard shell power battery according to a first embodiment of the present invention;

5 FIG. 2 is an enlarged view of a through slot of the battery cell protecting case of a circled portion A in FIG. 1;

10 FIG. 3 is an enlarged view of a through slot of a battery cell protecting case according to a second embodiment of the present invention;

15 FIG. 4 is an enlarged view of a through slot of a battery cell protecting case according to a third embodiment of the present invention;

20 FIG. 5 is an enlarged view of a through slot of a battery cell protecting case according to a fourth embodiment of the present invention; and

FIG. 6 is an enlarged view of a through slot of a battery cell protecting case according to a fifth embodiment of the present invention.

25 DETAILED DESCRIPTION OF THE INVENTION

[0021] Generally, a hard shell power battery includes a battery cell, a battery cell protecting case and a battery housing. The battery cell protecting case defines a receiving chamber. The battery cell is seated in the receiving chamber of the battery cell protecting case. The battery cell protecting case coupled with the battery cell is accommodated in the battery housing.

30 **[0022]** Referring to FIG. 1, the hard shell power battery in accordance with a first embodiment of the present invention generally includes a conductive supporting plate 10 and a nonconductive bracket 12 secured to two sides of the conductive supporting plate 10. The conductive supporting plate 10 and the nonconductive bracket 12 corporately define a receiving chamber for receiving the battery cell therein.

40 **[0023]** In order to safely protect the battery cell, the conductive supporting plate 10 of the present invention is made from conductive material, such as copper. An electrode (not shown), such as a positive pole, is electrically connected to the copper plate. Most of the copper plate is covered by a separator which can insulatively separate the conductive supporting plate 10 from the battery housing, but corners of the copper plate are not covered by the separator. The material of the separator is PET (polyethylene terephthalate) plastic, PP (polypropylene) plastic, or PE (polyethylene) plastic.

45 **[0024]** Referring to FIG. 2, a corner of the nonconductive bracket 12 connected to the conductive supporting plate 10 defines a through slot 14 in a center thereof. The through slot 14 has a curvature of 60 to 90 degrees and a width of 10mm to 50 mm, preferably 20 to 30mm. Because the corners on two sides of the conductive sup-
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porting plate 10 are not covered by the separator, an exposed portion 100 without insulative material, e.g. the separator, formed thereon is defined. The exposed portion 100 has a curvature of 60 to 90 degrees and a width of 20 to 30mm. To prevent short circuit of the battery cell in normal use, connection between the nonconductive bracket 12 and the conductive supporting plate 10 is a step type connection. An outer surface of the nonconductive bracket 12 is 0.5 to 3.0mm, preferably 1.0mm, higher than the outer surface of the conductive supporting plate 10. So, the height of the nonconductive bracket 12 and the curvature of the through slot 14 can insulate the exposed portion 100 in the through slot 14 from other parts of the battery housing in normal use. According to one embodiment of the present invention, the nonconductive bracket 12 is an integrated bracket made from plastic material by injection molding, and the plastic material is PP plastic.

[0025] The battery housing is made from conductive material, such as, aluminum.

[0026] In assembly, the battery cell is received in receiving chamber of the battery cell protecting case enclosed by the nonconductive bracket 12 and the conductive supporting plate 10. The copper electrode of the conductive supporting plate 10 is welded to a negative pole extending from the battery cell. Then, the battery cell and the battery cell protecting case are installed in the battery housing to form the hard shell power battery. Lastly, the assembled battery housing is connected to a positive pole via a top cover.

[0027] When the hard shell power battery described above is excessively pressed in use, the battery housing is deformed toward the exposed portion 100 until electrically contacts the exposed portion 100, the power battery occurs short circuit so as to discharge electricity and avoid safety accident, and the safety performance of the power battery under pressure is improved. Because the through slots 14 are defined in each of four corners of the battery cell protecting case to expose the exposed portion 100, the power battery will be short circuited when the exposed portion 100 in any one of the through slot 14 is electrically connected to the battery housing. Therefore, the rate of short circuit of the power battery is high when the battery housing is excessively pressed, to improve the safety performance of the power battery.

[0028] The through slot 14 of the nonconductive bracket 12 of the present invention is located in center of the corner of the nonconductive bracket 12 in order to make the battery housing to easily contact the exposed portion 100 in the through slot 14 when the battery housing is pressed. The width of the through slot 14 is about 20 to 30mm, which not only can make the battery housing contact the exposed portion 100 when the battery housing is pressed, but also can electrically insulate the battery housing from the copper plate when the power battery is in normal use.

[0029] Referring to FIG. 3, to improve the safety performance of the power battery in normal use, in the sec-

ond embodiment of the hard shell power battery in accordance with the present invention, a cross strip 16a is defined on the nonconductive bracket 12a over the through slot 14a of the nonconductive bracket 12a. The cross strip 16a is parallel to an edge of the nonconductive bracket 12a. A width of the cross strip 16a is in a range from 1 to 5mm, so as to sufficiently insulate the battery housing from the exposed portion 100a when the power battery is not deformed. When the power battery is excessively pressed, the battery housing will deform and, the battery housing breaks the cross strip 16a and electrically contacts the exposed portion 100a, thereby forming short circuit in the power battery.

[0030] FIG. 4 illustrates a third embodiment in accordance with the present invention, difference between the third embodiment and the first embodiment of the hard shell power battery lies in that the nonconductive bracket 12b in the third embodiment defines two through slots 14b in each corner thereof. A width of a blocking portion 18b located between the two through slots 14b is in a range from 1 to 3mm. The blocking portion 18b is arc-shaped. A cutout 19b with a diameter less than 10mm is defined below the blocking portion 18b. When a force on the blocking portion 18b is greater than a predetermined value, such as 1T, the blocking portion 18b is deformed downwardly. A width of each of the two through slots 14b is in a range from 10 to 40mm, a curvature of each through slot 14b is in a range from 60 to 90 degrees. In order to prevent the battery cell from being short circuit in normal use, a connection between the nonconductive bracket 12b and the conductive supporting plate 10b is also a step type connection. Outer surface of the nonconductive bracket 12b is 0.5 mm higher than that of the conductive supporting plate 10b. The height of the nonconductive bracket 12b, particularly the height of the blocking portion 18b, can ensure the copper plate to be insulatively insulated from other portions of the nonconductive bracket 12b. When the power battery is excessively pressed, the battery housing will deform, the blocking portion 18b is pressed down and deforms to be retracted in the cutout 19b, so that the deformed battery housing can contact the exposed portion 100 and short circuit the power battery.

[0031] Referring to FIG. 5, in the fourth embodiment of the hard shell power battery of the present invention, a corner of the nonconductive bracket 12c connected to the conductive supporting plate 10c defines a through slot 14c in a center thereof. A curvature of the through slot 14c in the corner is in a range from 60 to 90 degrees, a width of the through slot 14c is 30mm. Connection between the nonconductive bracket 12c and the conductive supporting plate 10c in the through slot 14c is a step type connection, and outer surface of the nonconductive bracket 12c is 0.5 to 3.0mm higher than that of the conductive supporting plate 10c. Difference between the fourth embodiment and the first embodiment lies in that the corner of the conductive supporting plate 10c is wholly covered by the insulative separator, and the conductive

supporting plate 10c doesn't be exposed in the through slot 14c. However, the top surface of the conductive supporting plate 10c is not arc-shaped, which is different from the shape of the conductive supporting plate of the first to third embodiments described above. A plurality of sharp protrusions 20c is disposed on the copper plate in the through slot 14c. Each sharp protrusion 20c is 0.1 to 1.0mm less than that of an outer surface of the nonconductive bracket 12c. The plurality of sharp protrusions 20c is normally covered by the separator, like other parts of the copper plate. When the power battery is pressed, if the pressure is less than a predetermined force, such as 1T, the plurality of sharp protrusions 20c cannot pierce the separator, and the battery cell insulative separates from the battery housing. If the pressure on the battery housing is greater than a predetermined value, such as 1T, the plurality of sharp protrusions 20c pierce the separator to contact the battery housing and further short circuit the power battery.

[0032] Referring to FIG. 6, in the hard shell power battery of the fifth embodiment of the present invention, the nonconductive bracket 12 defines a through slot 14d in a center thereof. A curvature of the through slot 14d in the corner is about 60 to 90 degrees, and a width of the through slot 14d is 30mm. Difference between the fifth embodiment and the first embodiment lies in that, connection between the nonconductive bracket 12d and the conductive supporting plate 10d in the through slot 14d is also a step type connection, outer surface of the nonconductive bracket 12d is about 0.5mm higher than that of the conductive supporting plate 10d. The nonconductive bracket 12d forms two locking blocks 22d which extend into the through slot 14d to press against the exposed portion 100. A height of each locking block 22d is equal to that of the nonconductive bracket 12d, so that the exposed portion 100 in the through slot 14d fully insulates the exposed portion 100 from other parts of the nonconductive bracket 12d. When the power battery is pressed, if the pressure is less than a predetermined force, such as 1T, the locking blocks 22d are still locked on the exposed portion 100, and the bare battery cell is insulated from the battery housing. However, if the pressure on the battery housing is greater than the predetermined value, such as 1T, the locking blocks 22d deforms to release the exposed portion 100. The exposed portion 100 rebounds up to contact the battery housing, so as to short circuit the power battery.

[0033] It can be known as described above, the hard shell power battery of the present invention does not need additional mechanical structure. When deformed under pressure, the battery housing can be electrically connected to the exposed portion via the through slot defined in the nonconductive bracket to short circuit the power battery and reduce the voltage of the battery cell. Therefore, safety performance of the power battery under excessive pressure is improved.

[0034] While the present invention has been illustrated by the above description of the preferred embodiments

thereof, while the preferred embodiments have been described in considerable detail, it is not intended to restrict or in any way to limit the scope of the appended claims to such details. Additional advantages and modifications within the spirit and scope of the present invention will readily appear to those ordinary skilled in the art. Consequently, the present invention is not limited to the specific details and the illustrative examples as shown and described.

Claims

1. A battery cell protecting case for assembling a battery cell having a positive pole and a negative pole in a conductive battery housing being electrically connected to one of the positive pole and the negative pole, **characterized in that** the battery cell protecting case comprising:

a conductive supporting plate (10, 10a, 10b, 10c, 10d) being electrically connected to the other one of the positive pole and the negative pole of the battery cell, and the conductive supporting plate (10, 10a, 10b, 10c, 10d) being provided with a layer of insulative material and an exposed portion (100, 100a) without insulative material formed thereon; and

a nonconductive bracket (12, 12a, 12b, 12c, 12d) coupled to the conductive supporting plate (10, 10a, 10b, 10c, 10d), the nonconductive bracket (12, 12a, 12b, 12c, 12d) having a through slot (14, 14a, 14b, 14c, 14d) corresponding to the exposed portion (100, 100a), the exposed portion (100, 100a) being capable of electrically connecting with the conductive battery housing via the through slot (14, 14a, 14b, 14c, 14d) due to deformation of the conductive battery housing under pressure.

2. The battery cell protecting case of claim 1, **characterized in that** an outer surface of the nonconductive bracket (12, 12a, 12b, 12c, 12d) is about 0.5 to 3.0mm higher than an outer surface of the conductive supporting plate (10, 10a, 10b, 10c, 10d).

3. The battery cell protecting case of claim 2, **characterized in that** the conductive supporting plate (10, 10a, 10b, 10c, 10d) is formed with a layer of nonconductive separator, and the exposed portion (100, 100a) in the through slot (14, 14a, 14b, 14c, 14d) is formed with at least one sharp protrusion (20c) which can pierce the separator and contact the deformed conductive battery housing when pressure on the power battery is greater than a predetermined value.

4. The battery cell protecting case of claim 3, **charac-**

terized in that the sharp protrusion (20c) is 0.1 to 1.0mm lower than the outer surface of the nonconductive bracket (12, 12a, 12b, 12c, 12d).

5. The battery cell protecting case of claim 1, **characterized in that** the nonconductive bracket (12, 12a, 12b, 12c, 12d) is formed with a cross strip (16a) having a width of 1 to 5mm over the through slot (14,14a,14b,14c,14d).

6. The battery cell protecting case of claim 1, **characterized in that** the nonconductive bracket (12,12a,12b,12c,12d) defines at least two through slots (14,14a,14b,14c,14d) with a blocking portion (18b) having a width of 1 to 3mm between two adjacent through slots (14, 14a, 14b, 14c, 14d), a cutout (19b) for receiving the blocking portion (18b) is defined below the blocking portion (18b), the blocking portion (18b) is deformed to be received in the cutout (19b) when the pressure on the power battery is greater than a predetermined value, thereby causing the deformed conductive battery housing to electrically connect with the exposed portion (100,100a) in the through slot (14,14a,14b,14c,14d).

7. The battery cell protecting case of claim 1, **characterized in that** the nonconductive bracket (12, 12a, 12b, 12c, 12d) is formed with a locking block (22d) extending into the through slot (14, 14a, 14b, 14c, 14d) to press against the exposed portion (100, 100a), the locking block (22d) is deformed when the pressure on the power battery is greater than a predetermined value to release the exposed portion (100, 100a), thereby causing the exposed portion (100, 100a) to rebound up and to electrically connect with the conductive battery housing.

8. The battery cell protecting case of any one of claims 1 to 7, **characterized in that** the through slot (14, 14a, 14b, 14c, 14d) is defined in a center of the nonconductive bracket (12, 12a, 12b, 12c, 12d).

9. The battery cell protecting case of any one of claims 1 to 7, **characterized in that** the through slot (14, 14a, 14b, 14c, 14d) has a curvature of 60 to 90 degrees and a width of 10 to 50mm, preferably 20 to 30mm.

10. A hard shell power battery, comprising:

- a conductive battery housing;
- a pair of battery cell protecting cases corporately defining a receiving chamber for receiving a battery cell positioned in the battery housing, each battery cell protecting case comprising a conductive supporting plate (14, 14a, 14b, 14c, 14d) being provided with a layer of insulative material and an exposed portion (100,100a) without in-

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insulative material formed thereon and two nonconductive brackets (12, 12a, 12b, 12c, 12d) at two sides of the conductive supporting plate (10, 10a, 10b, 10c, 10d), each nonconductive bracket (12, 12a, 12b, 12c, 12d) defining a through slot (14, 14a, 14b, 14c, 14d) corresponding to the exposed portion (100, 100a) of the conductive supporting plate (10, 10a, 10b, 10c, 10d); and

a battery cell having a positive pole and an negative pole accommodated in the receiving chamber, one of the positive pole and the negative pole being electrically connected to the conductive supporting plate (10, 10a, 10b, 10c, 10d) and the other one of the positive pole and the negative pole being electrically connected to the conductive battery housing, the exposed portion (100, 100a) being capable of electrically contacting the conductive battery housing via the through slot (14, 14a, 14b, 14c, 14d) due to deformation of the conductive battery housing under pressure, so as to short circuit the power battery.

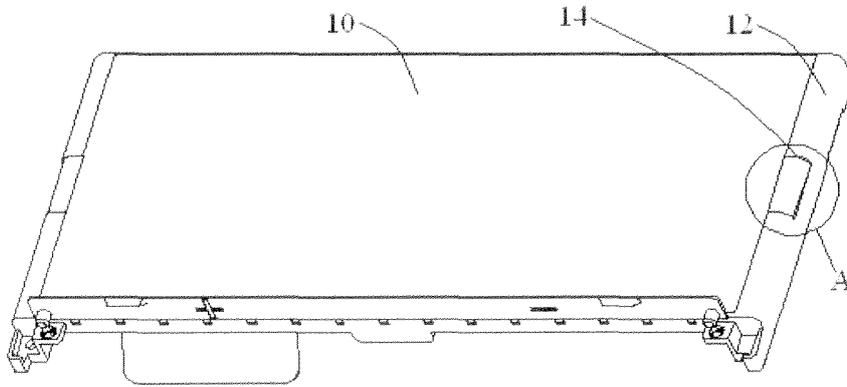


FIG. 1

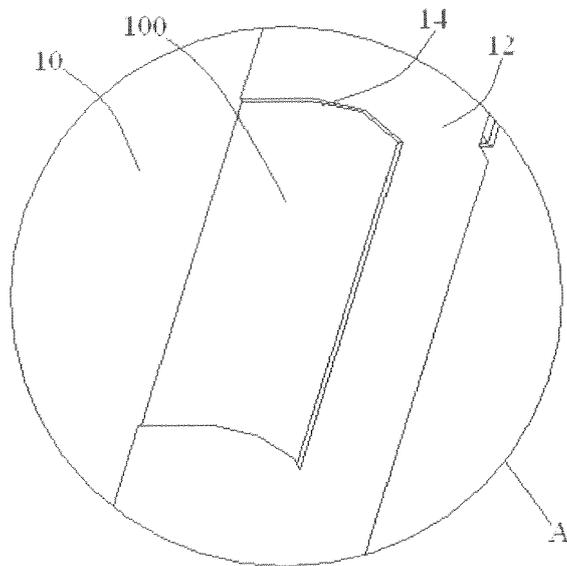


FIG. 2

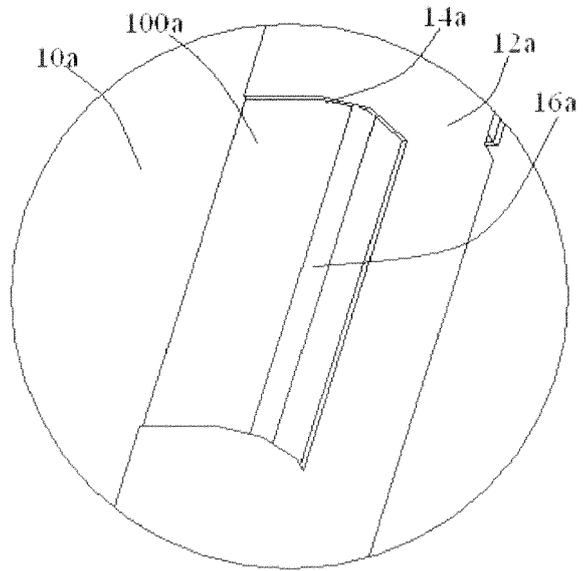


FIG. 3

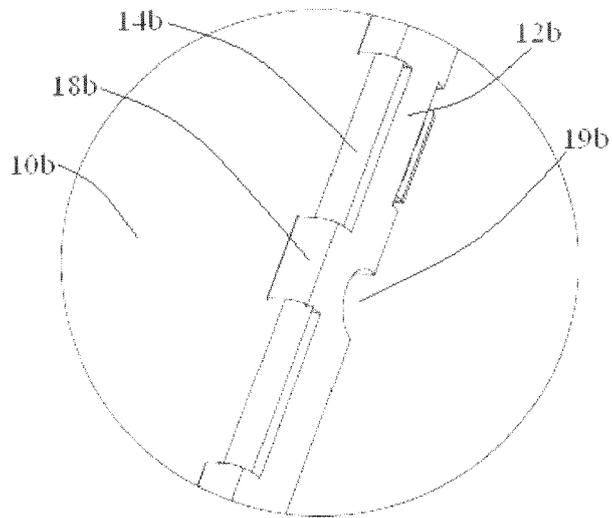


FIG. 4

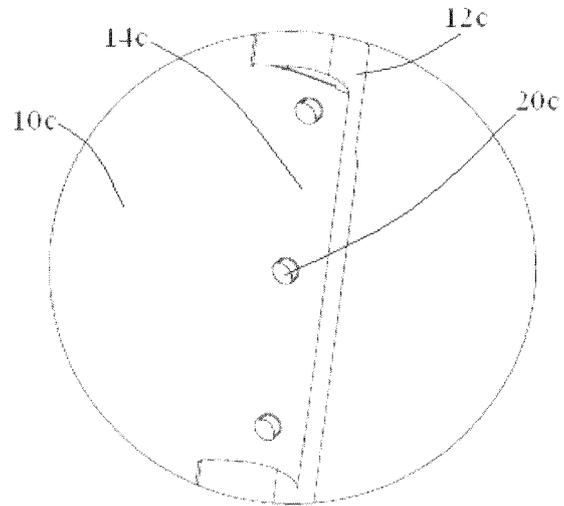


FIG. 5

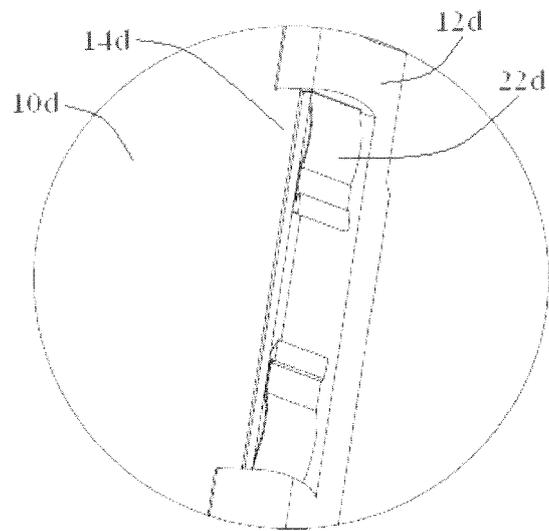


FIG. 6



EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2007/269711 A1 (MEGURO TAKESHI [JP] ET AL) 22 November 2007 (2007-11-22) * claims 1-46; figure 1 * -----	1-10	INV. H01M2/10 H01M2/34
A	EP 2 518 813 A2 (LG CHEMICAL LTD [KR]) 31 October 2012 (2012-10-31) * claims 1-21; figure 1 * -----	1-10	
A	US 6 376 120 B1 (AZEMA TADAMITSU [JP]) 23 April 2002 (2002-04-23) * claims 1-8 * -----	1-10	
A	US 2008/280197 A1 (MACHIDA MASAKI [JP]) 13 November 2008 (2008-11-13) * claims 1-11 * -----	1-10	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			H01M
Place of search The Hague		Date of completion of the search 17 July 2014	Examiner Battistig, Marcello
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 14 16 0709

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17-07-2014

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007269711 A1	22-11-2007	JP 4984892 B2	25-07-2012
		KR 20070084079 A	24-08-2007
		TW 1288981 B	21-10-2007
		US 2007269711 A1	22-11-2007
		WO 2006049167 A1	11-05-2006

EP 2518813 A2	31-10-2012	CN 102668226 A	12-09-2012
		EP 2518813 A2	31-10-2012
		JP 2013514626 A	25-04-2013
		KR 20110072241 A	29-06-2011
		US 2012257349 A1	11-10-2012
		WO 2011078536 A2	30-06-2011

US 6376120 B1	23-04-2002	JP 2000003702 A	07-01-2000
		US 6376120 B1	23-04-2002

US 2008280197 A1	13-11-2008	CN 101304103 A	12-11-2008
		JP 4586820 B2	24-11-2010
		JP 2008277207 A	13-11-2008
		KR 20080099163 A	12-11-2008
		US 2008280197 A1	13-11-2008
		US 2012214061 A1	23-08-2012

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201310090765 [0001]